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ROYAL BOTANIC GARDENS, KEW

XVI—NOTES ON SOME GRECIAN SEMPERVIVA.

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Apart from the account in Halácsy's "Conspectus Florae Graecae," there exists practically no reliable, and certainly no detailed, published information on the Grecian and Albanian *Semperviva*. Praeger, in his "Account of the genus *Sempervivum*" (London: 1932), completely ignored these two countries and submerged *S. marmoreum* Grisebach and *S. Reginae-Amaliae* Held. & Guic., both Grecian in origin, under *S. Schlehani* Schott without comment and contrary to the International Rules of Nomenclature. Older writers give only scanty, or even inaccurate, information thereon, although it was quite clear from these references that there were many *Semperviva* to be found throughout Greece, their specific nature, however, remaining in doubt. No reference was made to Albanian plants, except the mere record of the occurrence of *S. marmoreum* Griseb. and *S. Heuffelii* Schott without further details, but this was to be expected as the difficulties in the way of botanical expeditions to this country were immense.*

In 1937 E. K. Balls visited Greece and spent most of his time in the Epirus and Grammos mountains (see fig. 1). At my request he paid special attention to the *Semperviva* and made a representative collection of specimens. With reference to their distribution he noted (in litt.):

"In answer to your question as to whether *Semperviva* were absent from any area I think that on every high mountain we found some. The central Pindus, about Agrafa, appears to have provided only *S. Heuffelii* and I think that in the Epirean Peristeria there was very little else, the other species we found there was only in very small quantity. Below about 7000 ft. I do not think we found *Semperviva* at all; they were usually pretty high on all the mountains and not nearly so free growing on the southern mountains as on the northern ranges. The Grammos mountains were much more prolific than any others which we visited."

These plants could quite readily be divided into three groups:—*S. Heuffelii* Schott, a number of pubescent plants, and four glabrous specimens.

The four glabrous plants were collected from Mt. Tschumba Petzi, Mt. Kambeecho, and Mt. Skrutsch (three adjoining peaks, between the mountains of Grammos and Mavri Petri, of the Grammos

* I have now a number of Albanian *Semperviva* in cultivation but as they have not yet flowered description would be premature.

Fig. 1. Sketch map showing mountains referred to in the text.

range on the Albanian-Greek frontier), and from Smolika, which is about twenty-five miles to the south of these. Although these plants showed small individual variations they appeared to belong to a single species which could not be matched with any existing description or material. The Tschumba Petzi plant flowered for the first time in 1939 and is described below as a new species. The Kambeecho and Skrutsch plants have also flowered, though not quite normally, and the one from Smolika has not yet flowered. On continued observation these three plants are sufficiently near to the type to warrant their inclusion, at least for the time being, in this species.

The field note for the Tschumba Petzi plant is as follows :— " B 3961a, Tschumba Petzi near Grammos, 8500 ft., 4.9.37.

This is probably the same as 3961, though growing in very different conditions it appears completely different. Leaves a bright glossy green and apt to stiffen outwards making a rather flattened rosette to 2 ins. across. Growing on steep grass banks in shade of tufts of long grass. A grey claylike soil, rather wet. (These rosettes are all that were collected and the plant does not seem very profuse in this situation.) "

In cultivation the above notes apply to plants in the spring or when grown in the shade, but given full exposure the rosette becomes more globular, the leaves shorter, thicker and more erect or even incurled, and the whole rosette more dense. The central leaves remain bright green while the outermost leaves develop pink shades. When viewed either from above or from the side the absence of marginal cilia is very striking, the leaf appearing to have a rounded edge not shown by any other species. The plant does not increase very rapidly, giving off only a few stolons each year, but grows well, slowly forming a close clump in which the rosettes are decidedly below more isolated ones in size. When established it flowers readily in late July and early August and may go on into September. It stands the winter satisfactorily.

Sempervivum Ballsii *Wale*, sp. nov.; a *S. marmoreo* Griseb. planta minore, rosularum foliis erectioribus apicibus haud purpureis parte superiore marginibus eciliatis, inflorescentia minore compactiore languidiore differt; a *S. Reginae-Amaliae* Held. et Guic. rosularum foliis glabris, caulibus floriferis minus puberulis, foliis paucioribus, floribus languidioribus distinguitur.

Rosettes about 3 cm. across (2·5 to 3·5 cm.) sub-globular, inner leaves closed, outer more open and erect, but the short thick leaves give the rosette a dense appearance. In the spring the outer leaves longer and thinner and the rosette as a whole more open. *Rosette leaves* about 18 mm. × 6·5 mm. × 1·7 mm., obovate, abruptly mucronate, slightly convex on face, convex on back, glabrous, sparingly ciliate on lower two-thirds, no cilia on upper third, bright green with olive to yellow tinge, outermost leaves tinged yellow to light red. Leaves of young rosettes lightly hairy on midrib and ciliate almost

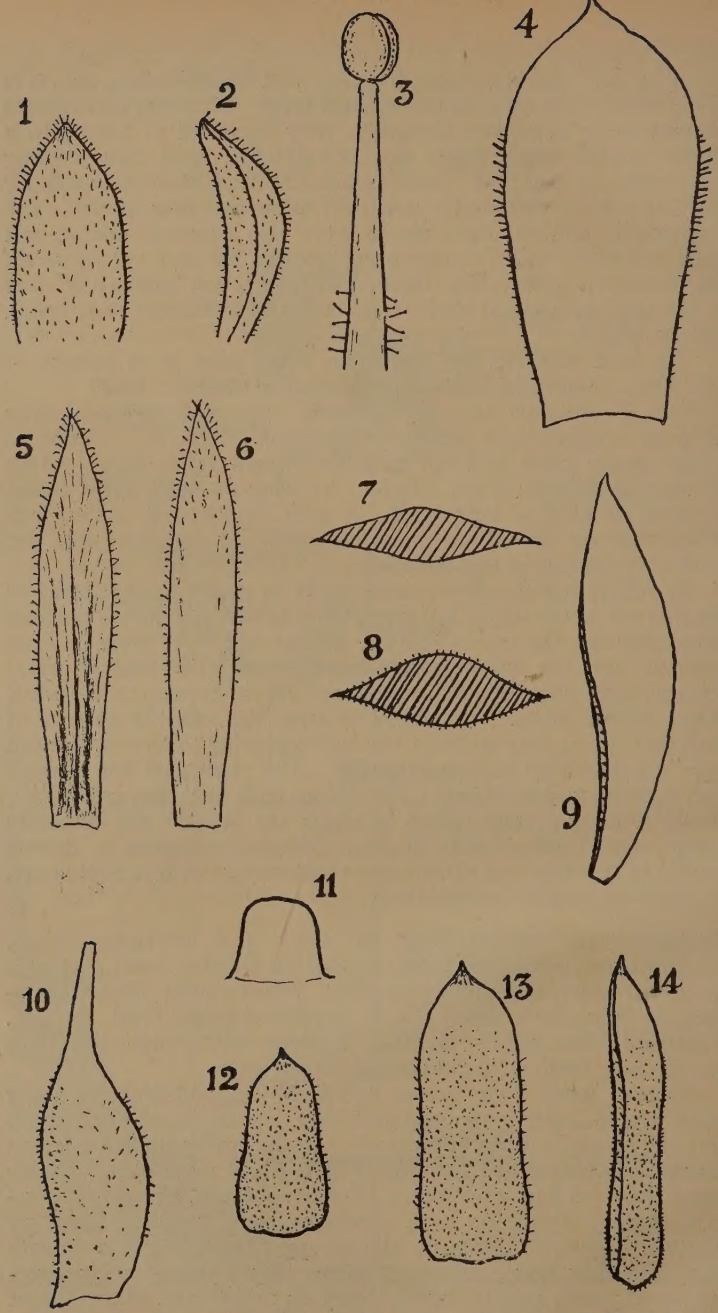


Fig. 2. *Sempervivum Ballsii*.—1, Sepal, abaxial surface; 2, Sepal, lateral view; 3, Stamen; 4, Rosette leaf, abaxial surface; 5, Petal, adaxial surface; 6, Petal, abaxial surface; 7, Rosette leaf, transverse section; 8, Cauline leaf, transverse section; 9, Rosette leaf, lateral view; 10, Carpel; 11, Scale; 12, Upper cauline leaf, abaxial surface; 13, Lower cauline leaf, abaxial surface; 14, Lower cauline leaf, lateral view.

to tip. *Offsets* three to four in May. *Stolons* basal, horizontal, thick even when young, 1–1·5 cm. long, up to 2 mm. thick with a few ovate leaves hairy on both faces. *Flowering stem* 10 cm. high, broad at base narrowing abruptly, rest of stem hardly tapering at all, sparingly clothed with erect only slightly overlapping leaves, lower ones linguiform upper oblong to ovate-lanceolate, 17 mm. × 5·5 mm. × 1·6 mm. to 9·5 mm. × 5 mm. × 1·5 mm., lower sparingly ciliate and puberulous on proximal two thirds, upper puberulous sparingly ciliate on proximal two thirds, stem sparingly hairy with short hairs. *Inflorescence* small, compact, spheroidal, flattened from above to below, about 4 cm. across, of two simple and two dichotomous branches with central bud and about twenty-five flowers sparingly covered with short hairs, bracts small and few. *Bud* ovoid, flattened at tip. *Flower* 12-parted, 1·8–2 cm. in diameter when fully open, dull rose colour, on very short pedicels. *Calyx* cup-shaped, puberulous, green with varying amount of red at tip, 5 mm. long, the segments oblong-lanceolate 3 mm. × 1·2 mm. × 0·7 mm. *Petals* lanceolate, acuminate, 9 mm. × 1·4 mm., margins pink with broken central dull crimson band, unbroken deeper in colour and brighter at base, greenish in centre and more so on back where only the edges are pink, sparingly pubescent on back, ciliate on distal two thirds of edges hairs longest at tip. *Stamens* 4 to 4·5 mm. long, filaments crimson except for small white zone at each end, a few hairs near base; anthers ovoid, buff to pinkish-buff, pollen yellow. *Scales* about 0·5 mm. × 0·5 mm., rounded quadrate, greenish. *Ovaries* slender, pale green, finely hairy on inner surface and a few hairs on outer surface, 2·5 mm. long, styles slightly divergent, pinkish, 1·5 mm. long.

Flowers July to August (in S. England).

Greek Epirus: on Mt. Tschumba Petzi, Grammos range, on steep grass banks, *E. K. Balls* 1937 (typus in Herb. Kew.).

The Grammos range is the centre of a mountainous area rich in *Semperviva*, but the only known species at all similar to *S. Ballsii* are *S. marmoreum* Griseb. and *S. Reginae-Amaliae* Held. et Guic. With regard to *S. marmoreum* I have not yet obtained living plants from Mt. Athos but after examining some good flowering material in the Kew Herbarium I agree with Dr. Turrill (Bull. Soc. Bot. Bulgaria, **7**, 126 : 1936), in accepting this as the same as *S. Schlehani* Schott which it then supersedes, being described ten years earlier. In rosette the distinction of *S. Ballsii* from *S. Reginae-Amaliae* is easy as the latter plant has puberulous rosette leaves. When in flower the plants are readily distinguished as *S. Reginae-Amaliae* has flower stems with crowded, thick, ovate leaves and brightly coloured flowers, while *S. Ballsii* has much less well clothed and less hairy stems and dull coloured flowers. From *S. marmoreum* it is distinguished by its smaller size, more upright habit of the rosette leaves, which are never purple tipped and have no cilia on the distal third of the leaf margins, and the smaller, more compact

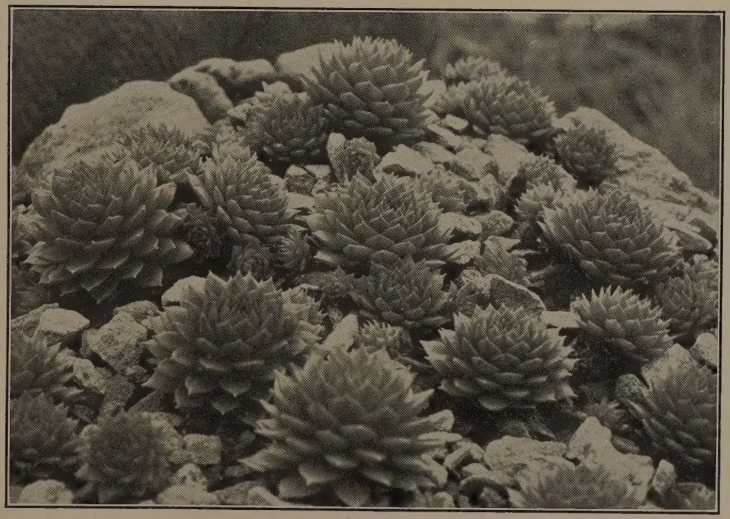
and duller inflorescence. *S. octopodes* Turrill from Mt. Peristeri, N. Macedonia, and *S. ciliosum* Craib from Mt. Mali Hat, Galicića range, between lakes Ochrid and Presba, are the next nearest species geographically, but both are readily distinguished by their hairy rosette leaves, yellow flowers and many other details. *S. macedonicum* Praeger has not been recorded farther south than Mt. Krcin above Debar on the Serbian-Albanian frontier and this also has pubescent rosette leaves. The rosette of *S. Ballsii* is similar to *S. minor* Turrill (mss.) but the rosette leaf of the latter is quite different in shape with marginal cilia almost to the tip, and the flower is yellow.

The comparison of the new species given in the table below is made on the basis of eighteen specimens of *S. marmoreum* collected in Bulgaria, Jugoslavia, and Albania and on a plant from Mt. Vardusa, Greece, collected some years ago by Miss D. Lowe and on additional material from the same locality collected in 1937 by E. K. Balls, which I regard as typical *S. Reginae-Amaliae*. Contrary to Praeger (op. cit. 59, " green with rarely a red-purple tip, or flushed red over face and back—mostly excepting the margin ") all my collected forms of *S. marmoreum* are red-brown tipped, commonly very deeply so.

	S. marmoreum.	*S. Ballsii.*	*S. Reginae-Amaliae.*
Rosette	Very variable in size, medium to large, half open sub-dense. Leaves fairly numerous.	Small to medium, compact, dense, few leaves.	Small to medium, compact, dense, not many leaves.
Rosette leaf ...	Spathulate. Deep green, strong brown-purple tip or distal half. Margins strongly ciliate to tip. Glabrous.	Obovate. Bright green, outer leaves colouring pink. No cilia distal quarter or third. Glabrous.	Spathulate-obovate. Dull green, outer leaves colouring light red. Ciliate to tip. Puberulous.
Rosette leaves of young offset.	Hairy.	Few hairs on mid-rib.	Puberulous.
Stolons	Medium to long.	Short.	Short.
Flower stem ...	Narrows abruptly at base, rest of stem same width. Densely hairy, long and short hairs.	Narrows abruptly at base, rest of stem same width. Sparingly hairy, short hairs.	Narrowing gradually from below up. Hairy, long and short hairs.
Inflorescence ...	Large, open, flat-tish.	Small, compact, spheroidal.	Small to medium, flattish.
Stem leaf	Deltoid-ovate to linguiform. Strongly ciliate to tip. Pubescent.	Linguiform to deltoid-ovate. Ciliate proximal three quarters. Sparingly pubescent proximal three quarters.	Ovate to oblong-ovate. Ciliate to tip. Puberulous.

PLATE V

1. *Sempervivum Ballsii* (no. B.3961), flowering rosettes.



2. *Sempervivum Ballsii* (no. B.3961), vegetative rosettes.

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	S. marmoreum.	*S. Ballsii.*	*S. Reginas-Amaliae.*
Stem leaf ...	... Strong brown-purple tip.	Pinkish tip at the most.	Outer leaves may be pink tipped.
Petals ...	... Central bright crimson band with white margins.	Dull pink broken central band with pink margins.	Central solid crimson band.
Anthers ...	... Pink to red.	Buff to pink-buff.	Buff.
Scales ...	... Rounded, small.	Rounded quadrate.	Semicircular tip, twice as long as broad.

Apart from *S. marmoreum* Griseb., no reliable reference has been found in the literature to any glabrous Grecian *Semperviva*. Boissier records *S. tectorum* (Fl. Or. **2,** 796 : 1872) as " glabris vel minute glandulosis " from Mts. Olenus and Parnassus, but gives it as equal to *S. Reginae-Amaliae* Held. et Sart. (mss.) and *S. montanum* Smith ex Prod. Fl. Graec., both pubescent plants. I have a plant from Mt. Parnassus which is hairy but none from Mt. Olenus. He also describes the variety " *marmoreum* " from Mt. Athos only, with the criterion that the scales are almost absent, giving as synonyms *S. marmoreum* Griseb. and *S. purpurascens* Schott, both of which are glabrous. Halácsy records many stations for *S. Reginae-Amaliae* Held. et Guic., again without reference to any glabrous plant. It would thus appear that the plant now described as *S. Ballsii* was unknown to these authors.

The pubescent plants collected by E. K. Balls and mentioned at the beginning of this article have, with the exception of the Vardusa plant, failed to produce satisfactory flowers. They present a number of minor differences in rosette, of which colour is the most striking, but provisionally I have placed them all together as forms of *S. Reginae-Amaliae* Heldreich et Guiccardii ex Halácsy.

There is some confusion in the literature regarding the authors responsible for the name *S. Reginae-Amaliae*. The reference from Halácsy must be regarded as correct but the source from which the description was obtained is not given. The specimen referred to by him (Fl. Gr. Exs. no. 2982, dated 1855), now in the Kew Herbarium, bears only the name. Boissier (Fl. Or. **2,** 796 : 1872) records, from manuscript, *S. Reginae-Amaliae* Held. et Sart., presumably after Sartori who was working with Heldreich at the time. Praeger (op. cit. 59) gives *S. Reginae-Amaliae* Heldreich et Sarnthein ex Boissier, probably by the erroneous expansion of Boissier's " Sart." It is quite clear that the same plant was intended by all these authors.

I am indebted to Mrs. H. P. Thompson and Mr. W. E. Th. Ingwersen for the many Balkan *Semperviva* with which they have so generously provided me, the results of many years skilful and accurate collecting.

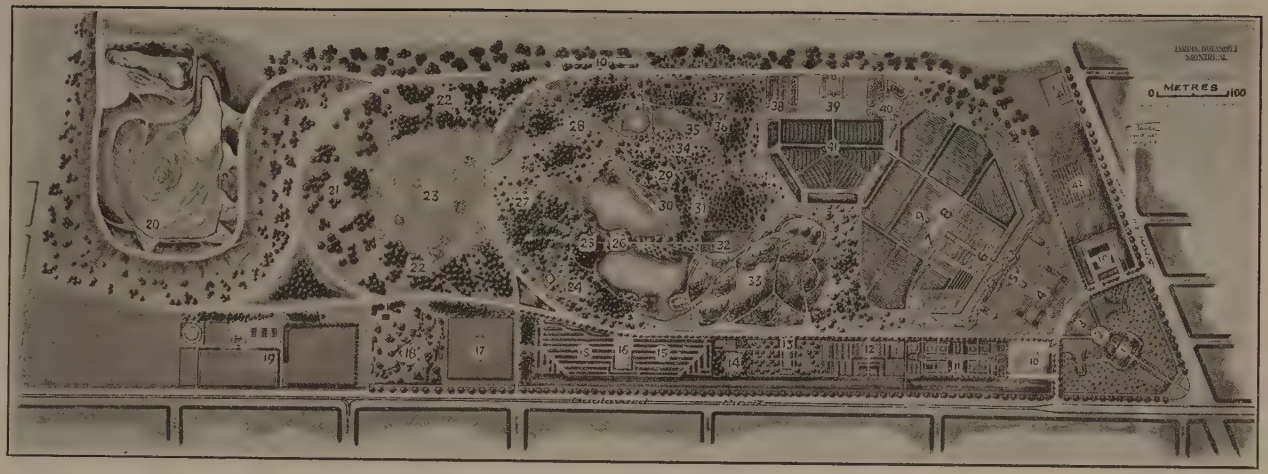
I wish to thank Dr. Turrill for the help which he has so freely given me on all matters connected with the preparation of this paper.

XVII—THE MONTREAL BOTANICAL GARDEN.

P. A. CHANDLER (Montreal Botanical Garden).

The Province of Quebec is well known for its rich forests of spruce and fir, for the high standard of its agricultural crops, and for the maple sugar and maple syrup extracted from *Acer saccharum*, known to all visitors to the Province. The gardens throughout the world have been enriched with many beautiful plants native to this region, notably *Pinus Strobus*, *Tsuga canadensis*, *Cornus canadensis*, *Sarracenia purpurea*, *Primula laurentiana*, and further gems are to be expected from the Gaspé peninsula. However, with the exception of some small gardens connected with agricultural institutes, and two feeble, unsuccessful attempts to establish a botanical garden within the Province in the latter part of the last century, there was until recently no garden of any botanical importance. The necessity for such a garden had long been felt by botanists and horticulturists throughout the Province, and due to their persistent efforts, notably those of Dr. Marie-Victorin, another attempt was made in 1933 to establish such a garden.

At this time the city of Montreal presented an area of 250 acres at the east end of the city which had been at one time set aside for a public park, but was never developed and had become more or less waste land. A Botanical Garden Commission was set up to formulate and direct the policy of the gardens under the chairmanship of Dr. Marie-Victorin, the present Director of the gardens. For the first three years little progress was made except for the building of two small greenhouses. However, in the summer of 1936 a plan was designed for the whole garden as it will be eventually (see Plate VI), and this design was carefully followed in the construction work which commenced shortly afterwards and which will be outlined later. Particularly interesting and noteworthy in considering the design of this garden is the fact that the available grounds were almost entirely bare of natural growth and nearly perfectly flat. Everything had to be created from the beginning. This had the advantage that no compromises had to be made with the existing features, as is usually the case with gardens of this type, while on the other hand it has the disadvantage that it is sure to take many years before the garden can be expected to assume anything like a mature aspect. In the plan of the garden as it was conceived, the knowledge available to-day of how a modern botanic garden may best serve the cultural interests of a community—in this case in particular the city of Montreal, the Province of Quebec and the whole of Canada—was fully utilized and the greatest advantage was taken of what were considered the finest ideas that have so far evolved from existing gardens. If the achievements to date are any indication of the final result, this method will be fully justified. In the planning of any garden of this type the climatic conditions have of course to be carefully considered ; here the long winters with sub-zero temperatures followed by hot summers would seem to place rather severe



MAP OF THE MONTREAL BOTANICAL GARDEN

1. Flower garden of annuals
2. Fountain
3. Cascade
4. Administration building
5. Display greenhouses
6. Service greenhouses
7. Garage and workshops
8. Heating plant
9. Nursery
10. Parking places
11. Display garden of perennials
12. Garden of economic plants
13. Fruit garden
14. Gardens of medicinal plants
15. Fruiticetum
16. Formal rock garden
17. Cricket field
18. Picnic grounds
19. Playgrounds
20. Ornamental planting in an old quarry.
21. Arboretum
22–37. Natural groups representing Canadian flora
    - 22. Western Canada
    - 23. Mid-Western prairie
    - 24. Sugar Maple formation
    - 25. Beech formation
    - 26. Damp shore formation
    - 27. Black Maple formation
    - 28. Northern deciduous forest
    - 29. Mixed forest
    - 30. Rich damp meadow
    - 31. Coniferous forest
    - 32. Bog
    - 33. Alpinum
    - 34. Red Pine association
    - 35. Sand dune
    - 36. Banks Pine formation
    - 37. White Pine formation
38. Biological-morphological groups
39. Water and bog plants
40. Genetic groups
41. Taxonomic garden
42. Breeding and testing field

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limitations on the kinds of plants that can be grown. But fortunately it has been found possible to grow a far wider range than might have been expected due to the heavy snow covering in the winter and the cooling effect of the numerous lakes and rivers in the vicinity during the summer.

After October 1936, when the garden received the benefit from a Provincial Government Relief Scheme for the Unemployed, construction work went ahead at a rapid pace, and during the three following years until the outbreak of the war, great progress was made, although there is still a great deal to be done. The following account will give some idea of the work accomplished to date and that which remains to be carried out.

The administration building is completed, and, apart from the various garden offices which are spread over two floors, the Botany Department of the University of Montreal occupies one floor of the building. The building itself, from the exterior, has its own attraction, with a well-balanced water cascade leading up to the front entrance. To capture the botanical spirit, two inscriptions to Linnaeus and Mendel are to be found on either side of the entrance. The projecting entrance hall and winter gardens are built of a white stone, while the main body of the building is of a yellow brick. On entering, one's attention is attracted to the winter gardens, one on each side, where seasonal displays of flowering plants are maintained. Here of great fascination to the visitors are the four small aquaria, set into the wall at eye level, filled with tropical water plants and tropical fishes. The main body of the building consists of four wings with the central section devoted to a large air-conditioned auditorium for conferences, meetings, and lectures. This hall has a seating capacity for 600 people and is equipped with all the modern apparatus for the projection of moving pictures and lantern slides. Decorated in a pastel shade of green and equipped with indirect lighting, it creates a feeling of beauty and peace such as we all associate with plants, while a scientific atmosphere is provided through the names of famous botanists inscribed along the walls. Throughout the whole building with its offices, library, herbarium, and laboratories, simplicity with efficiency has been the keynote of the design. Little has been left out of what one might expect to find in such a building, and a special photographic department, a student gardeners' lecture room and laboratory, a lunch room and rest room for the staff, a well equipped seed room, where the seeds are cleaned and prepared for distribution, a labelling room and a lantern slide room are a few of its component parts. Facilities for research in plant breeding have also been provided and the large laboratory reserved for this purpose includes an air-conditioned greenhouse where light, humidity and temperature can be accurately controlled.

Directly behind the administration building will be located the display greenhouses extending in a wide V formation to a length of

1200 feet, although at the present time only the concrete foundations of these greenhouses have been built. Provision has been made for the display, all under one roof, of tropical and temperate region plants, and collections of succulents, cacti, ferns, orchids, aquatics, and alpines. It is the intention to plant these houses in a naturalistic arrangement so as to give an indoor garden effect depicting the plant life in other regions of the world. Among the many interesting and novel features of this complex of display greenhouses the aquarium room located in the basement of the *Victoria regia* house is of special note. From the centre of this room one may view the *Victoria regia* from beneath through the glass bottom of its tank. Around the sides of the aquarium room aquaria are to be built into the walls which will be lit artificially and will contain a large collection of submerged water plants. In keeping with the modern ideas of economy the service greenhouses for the propagation of plants for the display houses and the outside gardens are located in close proximity to the display houses and are connected with them by a covered passage. Altogether there are 18 of these thermostatically controlled service greenhouses each equipped to serve some special type of culture. Two of these houses located at the end of the group have been fitted out with work tables in the centre and will be used for popular courses in horticulture, both for adults and for school children. One other house is reserved for plant breeding and one for experiments in plant physiology. The large centrally located workroom from which all the houses branch off laterally is an essential feature here because of the severe winter temperatures. Apart from propagating houses and electrically heated hot-beds, modern greenhouse equipment is not complete without a refrigerated room for the chilling and after-ripening of seeds of northern temperate zone plants to facilitate germination. This latter has been installed here in one of the greenhouse cellars. Equipment for soil sterilization has also been provided. Surrounding the houses an extensive range of heated and unheated frames, together with four cool sunken pits, furnish a complete and economic set up. The central heating plant, along with the garages, engineer's and carpenter's shops adjoining the frame yard, bring all the buildings into a very compact unit.

The principle followed in many gardens to relegate the nursery to any odd corner which may be available, no matter whether the situation or soil may be suitable, has not been followed here. Realising that the nursery is one of the most important units of the garden a large area surrounding the frame yard has been reserved for this purpose. Special sections are devoted to trees and shrubs, herbaceous plants, alpines, and woodland plants, the latter accommodated under a well-constructed lattice shelter. This nursery area will have an aesthetic value of its own, with hedges of *Thuja occidentalis* creating vistas and giving a neat and trim appearance. Without special permission the public will not be admitted

to this enclosed area which includes not only the service houses, frames and nursery, but also a taxonomic garden which is not yet planted. Inside the fence of the nursery a wide border will be planted to provide plant material for distribution to the educational institutes and schools throughout the city for practical demonstrations. A meteorological station has also been established within this area.

Of the ornamental features which have been finished to date, the area in front of the administration building claims our first attention. Here a series of formal beds and borders, devoted especially to a display of bulbs in the spring and annuals and other bedding plants in the summer and surrounded by a broad expanse of lawn planted with conifers, forms a quiet yet imposing entrance and immediately creates a desire to seek more. The attention of passing motorists is also attracted by these displays as they pass along the main highway, and many are induced to stop and enter the gardens. Not forgetting modern modes of travel by automobile which call for adequate parking space, two comparatively large areas on either side of the entrance garden are available for the influx of visitors travelling by car who may be expected from all parts of Canada and the States. High winds play havoc in any garden and particularly here where the prevailing N.W. wind blows down from the Arctic. To afford some protection a high bank of soil was placed along this side of the garden and has been planted with trees and shrubs. A glance at the map will show a series of special gardens running parallel with the boulevard on one side of the grounds.

The first garden to be noticed is the perennial flower garden for the display of herbaceous plants. A formal arrangement with broad paths, a stone pergola at each end connected by a raised promenade, and a wide central strip of grass terminating in two small pools form the predominating features of the design. The idea, besides providing a colourful display during the whole season, is to show the best varieties of herbaceous plants in separate beds so that visitors can form their own opinion as to which they might like to grow in their own gardens. There are large beds of delphiniums, paeonies, asters, lupins, *Hemerocallis*, and dahlias, while in separate sections irises, lillies, and astilbes are displayed ; with this arrangement the individual requirements of the plants can be taken into consideration much better than if all were mixed, and such plants as the gentians, for instance, which were all brought together on a specially constructed bed, have been provided with a special underground watering system. Visitors who wish to see a floral display at a certain period of the season will find something of interest in the four large seasonal sections for the months of May, June, July, August and September. The rose garden, which is such a prominent feature in many European and American gardens, is not of equal importance here owing to the uncertainty of being

able to grow roses satisfactorily under the severe climatic conditions of Montreal, but it is hoped that by judicious attention to winter protection some of the hardier varieties will succeed, notably the polyantha section. Therefore a small area in the centre of this garden has been planted with roses of this type. In contrast to the roses, tropical water-lilies are a great success in the summer in the formal pool opposite the rose beds.

Without doubt, the greatest public interest up to the present has been aroused by the economic garden, which has for its main purpose to bring about a better understanding of the commoner plants of everyday use. Directed by notices the visitors follow a definite route which has been so planned that all groups are passed in their order. First comes the collection of fruits, where tomatoes of all shapes, sizes, and colours, melons (for which the Island of Montreal is famous), cucumbers and gourds, as well as egg plants and peppers may be seen. The next notice reads: "Curious Plants." Here are to be found amongst others, the squirting cucumber (*Ecballium elaterium*), the gas plant (*Dictamnus albus*), and the pitcher plant (*Sarracenia purpurea*). Root crops follow, giving a kitchen garden aspect with neat rows of potatoes, turnips, parsnips, beetroots, and carrots in many varieties; these have attracted the public's attention to a marked degree. The next section may be of special interest to the French who are well known as connoisseurs of salads and the closely allied "epinards" (spinach). Amongst a fine collection of these plants are to be found numerous varieties of lettuce, sorrel, dandelion, rocket salad, orache, and the little used baselle. Although the brassicas do not hold such a place of importance here as they do in more temperate regions, many can be grown in the summer as can be seen in the next section which contains varieties of cabbage, cauliflower, Brussels sprouts, kales, etc. Under the notice "Plantes condimentaires" come the vegetables such as the leeks, onions, and other edible species of *Allium*, followed by an extensive collection of herbs. Foreign visitors are usually much interested in the plants used for food by the American Indians, and it is only appropriate that a special section should be devoted here to a display of these plants since many of the Indian tribes are still native to the country. Indian rice (*Zizania aquatica*), Indian cucumber root (*Medeola virginiana*), and Indian breadroot (*Psoralea esculenta*), along with many others, form an interesting collection. The economic importance of the seeds of legumes is ever increasing and the wide selection of peas and beans grown illustrates this fact. The universally important soybean (*Glycine max*) is not only found in this group, but also in the oil-producing plants which follow and the forage plants, which adequately illustrates its great importance amongst the commercial crops of the world to-day. Plant dyes and then textiles follow, where cotton (*Gossypium herbaceum*), flax (*Linum usitatissimum*), and jute (*Corchorus olitorius*) are to be found amongst others. The

general public as a rule has a very limited knowledge of the culture of cereals and in many cases only a vague idea of what the different kinds look like. Hence the large group of many varieties of wheat, barley, oats, rye, corn, sorghum, and buckwheat, is of great interest and educational value. The growth of the tobacco industry in Canada is increasing from year to year, hence a selection of 12 varieties is appropriate. The perfume and scented plants follow and finally the group of forage plants to finish the tour. Altogether some 490 kinds and varieties of economically important plants are grown in this garden. Each variety bears a label giving the botanical name and the common name in both French and English. Since French is the spoken language of 73 per cent. of the population, the description of the plant's history and uses is given in French. It is evident even from the short time this garden has been in operation that it has been most enlightening to the visitors from many points of view. There are countless ways by which the public benefits from a visit to this garden ; to cite only one, it gives a broader idea of the wide range of plant foods that can be grown here, and hence indirectly encourages the public to seek new varieties of food for the benefit of all concerned. Numerous parties of school children are shown round daily by a competent guide attached to the garden staff.

From the Economic Garden we pass to the Fruit Garden through a fine wooden pergola for the growing of grapes, which do exceedingly well in this Province. Besides the usual collection of apples, pears, plums, cherries, and other small fruits, nuts are also being grown, and include the pecan (*Carya Pecan*), butternut (*Juglans cinerea*), and walnut (*Juglans nigra*). The various methods of training fruit trees is also exhibited in a row of espalier pears. A medicinal garden, which at the present is still unfinished, completes a series of gardens where plants are grown that are of importance to man from an economic point of view.

Climatic conditions seem to favour the growth of alpines, and the large alpine garden, which is still in the course of construction, promises to give a good representation of the alpine flora of the world. This will be accomplished by grouping the plants on a series of mounds, each mound representing a different mountain range such as the Alps, the Pyrenees, the Balkans, the Himalayas, the mountains of Japan, the mountains of Eastern North America, the Rocky Mountains, etc. Only botanical species and varieties will be planted here, while improved horticultural forms and garden hybrids will be grown on a series of formal stone beds and dry walls in another part of the grounds. Through the Alpine Garden several streamlets will meander down to two large lakes which have been constructed. Around these lakes much natural planting will be done representing the bog and aquatic flora of the Province, which is particularly rich. A large area in this part of the gardens will be developed to illustrate the most important native

plant associations of Eastern Canada. Sugar maple, black maple, white pine, and mixed coniferous forest, with all the shrubs and herbs that usually accompany them in nature, will be the most important components of this native section, which will enable visitors to study Canadian plants in their natural habitat without having to travel thousands of miles.

So far the only progress made with the Arboretum is the gathering together in the nursery of young plants from propagating material obtained from all parts of the world. Next spring, however, it is hoped that time will be found to plant the Fruticetum beds which are arranged in a series of terraces with broad grass paths. This system has its advantages, not only because it permits the visitors a convenient view of the plants, but also because of the thorough drainage it provides. This drainage is most important in the spring when heavy flooding often occurs through the accumulation of water from the melting snow. This spring flooding is a problem throughout the garden, for the soil varies from a porous sand to a heavy clay, and to minimize the losses caused by waterlogging an extensive system of drainage has had to be installed. Fortunately at the end of the garden there is a quarry from which large quantities of stone have been taken for drainage and building throughout the garden. Eventually the quarry will be planted in a naturalistic manner to form a sunken garden.

As noted above, the water flora of the Province is extremely rich, hence an aquatic garden has a place of importance. Over 100 basins of various sizes have been constructed in such a manner that the water level in each one can be controlled as desired. Some basins with running water provide suitable homes for plants from swift running streams. The paths between the basins are sunken so that the plants can be viewed conveniently at table height and their beauty easily be seen. To-day much interest is being shown in biology and genetics, so that a collection of plants illustrating some of the principles of these branches of science will not only prove of interest to the student but also to the layman who reads so much about them in the popular journals of the day. The biological and morphological garden, and the genetics garden, constructed but not yet planted, are located on either side of the water and bog garden. A large area near the nursery has been reserved for plant-breeding experiments which the garden staff hopes to conduct after the construction of the garden is finished. Part of this area is used as a testing ground for new varieties of annual and other plants before they are used elsewhere in the garden, and much valuable information has already been gleaned from these tests.

Believing in the old truth that the younger one starts to learn of the beauties and uses of plants the greater will be one's appreciation in later life, the children have been encouraged. First, children may join a special kindergarten class where simple illustrated talks are given in the winter, followed by demonstrations on living plants

in the summer. Later as they grow up they may partake in the school gardening classes where each child is given a small plot of its own to cultivate under the guidance of a qualified teacher who gives lectures at the schools during the winter. One hundred took part in this endeavour last year. Following the example of other institutes of this kind a course for student gardeners has been organized here, and at present there are some 15 students gaining theoretical knowledge by following a series of lectures on the principles of botany and horticulture. An unusual feature not often incorporated in a botanic garden which has yet to be mentioned is a well equipped playground located on the north west corner of the grounds. It provides a wading pool and other play apparatus for small children as well as three tennis courts and ample space for cricket, football and baseball. During the winter it serves as a skating and hockey rink. A large area for a picnic ground which adjoins the playground is still under construction.

Much work has yet to be done and, as elsewhere throughout the world, the present crisis unfortunately has forced a standstill of the construction work, but let us hope that the day will soon come when the world will be at peace again, and the construction of this highly promising enterprise can be resumed. In the meantime the maintenance of the valuable collections of plants gathered during the past few years from all parts of the world is at least temporarily assured so that when the time comes, stock plants will be available for the raising of large quantities of plants for planting the unfinished sections of the garden. Even under the most favourable conditions it will take many years before this garden has that appearance of age and maturity which mark so many gardens of this nature throughout the world. But if progress continues as it has done during the past three years, and if the policy outlined in the beginning is followed in the future, the Montreal Botanical Garden promises to become eventually an institution of which the British Empire can justly be proud.

XVIII—THE URICURY WAX PALM. F. N. Howes.

A little-known vegetable wax, known as " uricury wax," believed to be new to commerce, has been imported into the United Kingdom from Brazil during the last few years. This wax is also known to have been shipped to some extent to the United States and to certain European countries, notably France and Germany, in small quantities.

In general appearance and in hardness this wax is very similar to carnauba wax (*Copernicia cerifera* Mart.), but manufacturers using it find it possesses certain definite characteristics of its own. In the crude state it is a deeper green colour than is usual with carnauba wax and more resinous. However, it is regarded as quite a good quality wax and intermediate in value between carnauba and

candelilla wax (*Euphorbia cerifera* Alc.) by manufacturers using vegetable waxes. Prices also have been intermediate between those ruling for these two waxes.

Uricury wax is used in much the same way as carnauba wax, which is the best known and most extensively used of the true vegetable waxes. A sample of the wax received at Kew after refinement in this country is chestnut brown in colour, practically odourless, hard and brittle, and possesses a sharp fracture. It can be readily powdered, yielding a pale cream-coloured powder. A sample of the crude unpurified wax is olive green, but somewhat uneven in colouring. It is perhaps not surprising that this wax should show similarity with carnauba wax for it is also the product of a palm and is a leaf wax.

The name "uricury" or "arucuri" which appears to have been adopted in trade circles for the wax is commonly used in Brazil for *Syagrus coronata* (Mart.) Becc. (synonym *Cocos coronata* Mart.), although this name has also been recorded for at least one other palm, *Scheelia Martiana* Burret (syn. *Attalea excelsa* Mart.). However, dried leaflets of the palm from areas where uricury wax is collected, obtained recently through a firm importing the wax, leave little doubt that the palm in question is *Syagrus coronata*. The leaflets, probably from a young or recently expanded leaf, are from 52–65 cm. in length and 3–3½ cm. in width at the widest part. They are somewhat tough or leathery in texture and a pale colour on the undersurface owing to the thin coating of wax which is deposited there. In the dried leaflets this is somewhat powdery and inclined to come off on the fingers in handling. It may be readily removed with the finger-nail and on scraping with a scalpel the blade is soon covered.

The method of collecting and preparing the wax adopted by the natives apparently differs from that usually employed with carnauba wax where the wax is beaten off the leaves in a closed room or shed and collects as dust (Kew Bull. 1936, 509–512). According to reports received a method sometimes adopted in the uricury areas is to crush the leaves and extract the wax with hot water. Another method is to scrape the wax from the undersurface of each leaflet with a blunt knife, a somewhat laborious process. It is possible that as the wax particles appear to cling more tenaciously to the undersurface of the uricury leaf than is the case with carnauba the beating method employed for separating carnauba wax from the leaf may not be satisfactory in the case of uricury wax.

Although the uricury palm is widely distributed in eastern Brazil the amount of wax produced suggests that so far only relatively small areas have been worked. Over wide expanses paucity of population and transport difficulties are regarded as likely to remove any possibility of the palms being exploited for wax. The crude product is in blocks or irregularly shaped pieces and packed in coffee bags for export. The main season is said to be from March

to April. Exports have been from Bahia but may also take place from Rio.

Syagrus coronata occurs in both tropical and sub-tropical Brazil. It is found in Pernambuco, Bahia, Minas Geraës, Santa Cathrina, Rio Grande do Sol, and may be said roughly to occur along the coastal districts from Pernambuco to Uruguay. The palm occurs also inland, often in quite arid areas but generally near rivers or water courses. It is found growing either in groups or singly.

In its natural habitat the palm attains a height of 6–10 m. with a straight cylindrical bole 2 dm. or more in diameter. The bole is generally closely studded with prominent leaf-scars and near the apex the remains of dead leaves remain attached for a considerable time. The individual leaves average about 3 m. in length, have short petioles and the leaflets densely packed along the rachis. A marked spiral arrangement characterises the attachment of the leaves to the trunk. Flowering takes place in August or September and mature fruits appear in December or January in most areas. The fruits are greenish-yellow ovoid drupes 3–4 cm. long with a fibrous but juicy and mucilaginous pulp surrounding the seed, which is said to be edible (Correa, 1926). Seeds vary from 2–3 cm. in length and 1–2 cm. in diameter and have a thick shell (2–4 mm.) and white oleaginous kernel with well-marked central cavity.

The kernels are rich in oil (35–40 per cent.) which may be used for edible purposes. The oil also has medicinal uses among the inhabitants, being esteemed by coast dwellers in Brazil for treating wounds caused by skates (Correa, 1926). Both seeds and kernels have been received at Kew in the past from produce or oil-seed importers, which suggests that attention may have been given to them as a possible commercial source of oil.

Like many other palms the leaves of this species are put to various uses by local inhabitants. They are commonly used for thatching dwellings and afford material for coarse ropes. Fly whisks are also made from the leaflets. A flour or starch may be prepared from the pith or bole which is used as food, but is said to be rather bitter.

This palm has been grown outside South America as an ornamental palm but is not so well known as a decorative palm as many of its near allies in Brazil (e.g., *Cocos plumosa, C. schizophylla, C. Romanzoffiana, C. Weddeliana*, etc.), which are now almost universal as ornamental palms, and some especially favoured as street or avenue palms, in both the tropics and subtropics.

Among its good points as a decorative palm in warm countries is the fact that it will thrive under a fairly wide range of conditions, has dense gracefully arched foliage of a pleasing bright green, and, unlike so many South American palms, is quite devoid of spines.

J. F. Bailey (1913) in referring to "*Cocos plumosa, C. flexuosa, C. coronata* [*Syagrus coronata*], *C. Romanzoffiana, C. Yatay, C.*

odorata and *C. Weddelliana*" growing in the open in the Brisbane Botanic Garden in 1913 remarked that "The first four mentioned are very similar in habit; the first being grown in thousands about Brisbane. They are easily grown, seemingly being not particular as to soil or situation, although on fairly free soil the best results are obtained. Their rapid growth is an important point in their favour, as is also the absence of spines, a great drawback to many showy palms. Being shallow rooters the various kinds of Cocos may be safely transplanted, even when quite large, if ordinary care is observed in the operation, and a time chosen other than when the young leaves are in a sappy condition."

A photograph which this writer gives of a palm of *Syagrus coronata* in the Brisbane Botanic Garden depicts it as a well-grown palm probably about 9 m. in height and 2·5 dm. in diameter. The column of dead leaves under the leaf crown, so characteristic of the palm in the wild state, is absent, the dead leaves having been probably removed from time to time for the sake of appearance.

Whether wax secretion takes place on the under surfaces of the leaves when the palm is grown in other countries, or to what extent, is not at present known. A young palm a few feet in height growing in the somewhat unnatural conditions of the Palm House at Kew clearly shows wax secretion on the undersurfaces of the leaves.

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XIX—CONTRIBUTIONS TOWARDS A FLORA OF BHUTAN: I.

C. E. C. Fischer.

Comparatively little botanical work has been done in the Indian State of Bhutan since the days of W. Griffith and J. D. Hooker. Mr. B. J. Gould, I.C.S., Government Agent for the States of Sikkim and Bhutan, has taken a keen interest in the flora during the past two years and has sent a considerable collection of herbarium material, as well as seeds, to Kew for determination. The first consignment of about 1100 numbers includes 4 new species already published (K.B. 1939, 663), a new variety, and some species which have not previously been collected either in India or at least in the Eastern Himalayas. In the following list of the new records the countries entered in brackets after the specific name indicate the regions from which the species has previously been recorded.

Hydrangea yunnanensis *Rehd.* [Hydrangeaceae]. (Yunnan).

Tsanka, 2300 m., fls. June, *Gould* 380, 381, "fls. blue"; *Gould* 679, "fls. white."

Pleurospermum Davidii *Franch.* [Umbelliferae]. (W. China).
Kitiphu, 4150 m., fls. June, *Gould* 530.

Cremanthodium humile *Max.* [Compositae]. (S.E. Tibet and W. China).
Yala, Piala and Gilela areas, 4600 m., fls. Aug. *Gould* 1325.

Saussurea Chapmani *C. E. C. Fischer* [Compositae]. (S.E. Tibet).
Bele-La to Paro, 3700 m., fls. July. *Gould* 966.

Chimaphila japonica *Miq.* [Ericaceae]. (W. China to Japan).
Near Chendebi, 2300 m., fls. June, *Gould* 686.

Trachaelospermum cathayanum *C. K. Schneid.* [Apocynaceae]. (China).
Hinglai-La to Nahi, 2500–2000 m., fls. May, *Gould* 271; near Tsarza-La, 2770 m., fls. June, *Gould* 309.

Lagotis yunnanensis *W. W. Smith* [Selaginaceae]. (Yunnan).
Near Bumtang, 3000 m., fls. June, *Gould* 441.

Euphorbia sikkimensis *Boiss.* subsp. **bhutanica** *C. E. C. Fischer*, subsp. nov. [Euphorbiaceae]; a typo caulis, foliis subter, pedunculis, ovariis, stylisque hirsutis distincta.

Stems 20 cm. or more tall, glabrous below, increasingly flocculent-hairy upwards. *Leaves* linear or linear-lanceolate, acute, narrowed to a rounded base, 3–5·7 cm. long, 8–17 mm. wide, glabrous and dark green above, grey flocculent-hairy below, lateral nerves numerous, obscure, ascending, much reticulated, the upper sometimes reddish; petioles very short. *Peduncles* up to 5 cm. long, slender, sparsely pubescent; partial peduncles up to 1·5 cm. long. *Floral leaves* sessile, broadly ovate to subrotund, acute, base rounded or truncate, 1·1–1·3 cm. long, 9–10 mm. wide, glabrous, red or olivaceous-red (when dry). *Involucral-leaves* like the floral but smaller. *Cyathium* turbinate, 2·5–3 mm. long, mouth with 5 short, triangular teeth, white-hairy within; glands subreniform, 1 mm. long, 2·6 mm. wide. *Stamens* ∞; filaments angled, 1·1 mm. long, glabrous; anthers subglobose, 0·5 mm. diam. *Ovary* articulated on a short glabrous stipe, smooth, subglobose, 1·1 mm. long, more or less hairy; styles 3, united in their lower third, more or less hairy, bifid at the apex. *Ripe fruit* not seen.

Chang-Na Na to Paro, 2950–2400 m., fls. May, *Gould* 128 (type in Kew Herb.).

Bulbophyllum shweliense *W. W. Smith* [Orchidaceae]. (W. China).
Near Tsanka, 2300 m., fls. June. *Gould* 388.

Cypripedium guttatum *Sw.* [Orchidaceae]. (Siberia, Tibet, China).
Paro to Bele-La, 2400–3300 m., fls. May, *Gould* 142.

This species was also found near Pa-roo in the Chumbi Valley flowering in June by *King's Collector* 452 and " about Chumbi " by *E. H. Walsh* 42.

XX—NOTES ON CAREX: XIV.* E. Nelmes.

New African Species of the Subgenus Indocarex Baill.

The main purpose of this paper is to describe three further new *Carices* collected by Mr. E. Milne-Redhead during his 1937–38 expedition to Northern Rhodesia and Angola. (See K.B. 1939, 159.)

The name *Carex spicato-paniculata* Boeck. mss. was published, without a description, by C. B. Clarke in Durand et Schinz, Consp. Fl. Afr. **5**, 690 (1894). He took the name from " Boeck. mss. in Rehm. Pl. exsicc. n. 5627 (sp. nov.)."

Clarke described the species as " *Carex spicato-paniculata* (C. B. Clarke in Durand and Schinz, Conspect. Fl. Afr. V. 690) " in Fl. Cap. **7**, 304 (1898), and cited six gatherings, including Rehmann's. These citations were arranged on a geographical basis and no type specimen was indicated.

As one of the new species described below is closely related to *C. spicato-paniculata*, and as Clarke's citations may include more than a single species, it seems desirable to choose a lectotype.

Rehmann's plant, collected at Houtbosch, Transvaal, is at Kew, and would be made the lectotype if it were a good specimen, but its fruits are not fully developed. Their shape would probably have changed considerably if they had reached maturity, and the branches of the panicles, suberect at the time of gathering, would almost certainly have become divaricate later. These are important points in such a difficult genus as *Carex*, and as another of Clarke's cited plants is a fully developed specimen, and agrees well with his description of the species, I call it the lectotype. This is *J. M. Wood* 1190, collected at Inanda, Natal.

The choice of Wood's plant instead of Rehmann's makes C. B. Clarke alone, not Boeckeler ex C. B. Clarke, the authority for the name.

Carex tricholepis *Nelmes*, sp. nov.; affinis *C. spicato-paniculatae* C. B. Clarke, sed paniculis secundariis laxioribus, squamis pubescentibus aristatis pallidioribus, utriculis majoribus magis dense pubescentibus praecipue differt.

Rhizoma lignosum, breve. *Culmi* usque 105 cm. alti, obtuse triquetri, laeves, foliati. *Folia* 8–11 mm. lata, flavescenti-viridia, inflorescentia breviora, viva acute canaliculata, sicca subplana, scabrida, longe attenuata, longe vaginantes; vaginae superne scabridae. *Inflorescentia* anguste paniculata, interrupta; *paniculae secundariae* 8–10, inferioribus 1–2 interdum exceptis binae, subpyramidales, sublaxae, inferiores distantes, inaequaliter longe exserte

* Continued from K.B. 1940, 137.

pedunculatae, superiores subapproximatae, incluse breviter vel brevissime pedunculatae; pedunculi stricti, scabridi. *Rhachis* pubescens, angulis hispidula; ramuli demum oblique vel horizontaliter divaricati, inferiores plerumque 1–3- sed usque 6-stachyi, superiores 1-stachyi. *Bracteae* foliaceae, inferiores longe vaginantes, inflorescentiam sub anthesin longe superantes, inflorescentiam statu fructifero subaequantes, superiores breviter vel vix vaginantes; vaginae superne scabrido-pubescentes. *Spicae* androgynaeceae (pars mascula parte feminea multo brevior), 1–1·5 cm. longae, subdensiflorae; bracteolae scabrido-aristatae, marginibus hispidulae. *Squamae* ovatae, acutae, hispidulo-pubescentes, pallide ferrugineo-virides, carinatae, scabrido-aristatae. *Utriculi* 5 mm. longi, squamis plerumque aequilongi, elliptico-obovati, oblique patentes, superne dense hispidulo-pubescentes, valde plurinerves, trigoni, pallide ferrugineo-virides, in rostrum longum subcylindricum brunneum hispidulo-pubescens ore bidentatum subabrupte contracti. *Stigmata* 3.

NORTHERN RHODESIA: Mwinilunga District; just south of Matonchi Farm in *Brachystegia* woodland, 18 February 1938, *Milne-Redhead* 3686A (type); 15 December 1937, *Milne-Redhead* 3686.

Carex macrophyllidion *Nelmes*, sp. nov.; affinis *C. spicato-paniculatae* C. B. Clarke, sed foliis angustioribus, rhachibus inflorescentiarum angulis solum hirtis, paniculis secundariis laxioribus, squamis pallidioribus, utriculis ellipticis glabris haud subabrupte rostratis, praecipue differt.

Rhizoma lignosum, caespitosum. *Culmi* circiter 60 cm. alti, subteretes, laeves, foliati. *Folia* 3–5·5 mm. lata, superiores inflorescentiam superantes, viva alte canaliculata, saturate viridia, sicca subplana, virescentia, longe attenuata, scabrida, longe vaginantes; vaginae laeves. *Inflorescentia* paniculata, interrupta; *paniculae secundariae* 5–6, inferiores singulae, superiores binae, subpyramidales, inferiores distantes, longe vel longissime exserte pedunculatae, superiores approximatae, brevius inaequaliter exserte pedunculatae; pedunculi stricti, laeviusculi. *Rhachis* angulis hispidulis exceptis glabra; ramuli demum divaricati, plerumque 1-stachyi. *Bracteae* foliaceae, inflorescentiam longe superantes, superiores angustissime, brevissime vel vix vaginantes, inferiores longe vaginantes; vaginae laeves. *Spicae* androgynaeceae (pars mascula parte feminea brevior), 7–10 mm. longae, subdensiflorae; bracteolae longe aristatae, marginibus hispidulae. *Squamae* late ovato-lanceolatae, acutae, glabrae, plurinerves, pallide viridulo-brunneae, marginibus anguste albo-hyalinae, carinatae, scabrido-aristatae. *Utriculi* 5·5–6 mm. longi, oblique patentes, plerumque squamis longiores sed interdum iis aequilongi, elliptici, trigoni, plurinerves, glabri, subinflati, brevissime valde stipitati, in rostrum longum latum marginibus parce hispidulum ore alte bidentatum subsensim desinentes. *Stigmata* 3.

ANGOLA: District of Moxico; by R. Mfumbu, in *Brachystegia* woodland, 7 January 1938, *Milne-Redhead* 3971 (type).

NORTHERN RHODESIA: Mwinilunga District; south of Matonchi Farm in *Brachystegia* woodland, 6 December 1937, *Milne-Redhead* 3511, 3684.

For reasons similar to those given above for choosing the lectotype of *C. spicato-paniculata*, it is here proposed to choose that of *C. nyasensis* C. B. Clarke.

This species was first described in Fl. Trop. Afr. **8**, 519 (1902). No type was indicated, but five gatherings were cited, all from Nyasaland, three collected by Whyte and two by Buchanan. The best material is that collected by Whyte on the Plains of Zomba, probably in 1896, and I accordingly make this the lectotype of the name. All the gatherings, except that of Whyte from N. Nyasaland, 1896, which is at least varietally distinct, appear to represent one species.

Carex angolensis *Nelmes*, sp. nov; affinis *C. nyasensi* C. B. Clarke, sed paniculis secundariis magis pyramidalibus et distantibus, spicarum parte mascula breviore, squamis pallidioribus cum utriculis interdum superne hispidulis, utriculis subabrupte rostratis, rostris planioribus differt.

Rhizoma lignosum, breve. *Culmi* 100–125 cm. alti, obtuse trigoni, laeves, foliati. *Folia* 5–8 mm. lata, inflorescentia paullo breviora, viva alte canaliculata, laete viridia, sicca subplana, brunnescentia, longe attenuata, superne scabrida, culmos longe vaginantia; vaginae laeves. *Inflorescentia* paniculata, valde interrupta; *paniculae secundariae* 6–8, superioribus 1–3 interdum exceptis singulae, subpyramidales, sublaxae, inferiores distantes vel remotae, longe vel longissime exserte pedunculatae, superiores subapproximatae, breviter vel brevissime incluse pedunculatae; pedunculi stricti, scabridi. *Rhachis* pubescens, angulis hispidula; ramuli demum divaricati, inferiores usque 3-stachyi, superiores 1-stachyi. *Bracteae* foliaceae, inflorescentiam plerumque longe superantes, inferiores longe vel longissime vaginantes, superiores breviter vel vix vaginantes; vaginae laeves. *Spicae* androgynaeceae (pars mascula brevissima), 7–13 mm. longae, subdensiflorae; bracteolae scabrido-aristatae, marginibus hispidulae. *Squamae* ovatae, acutae, glabriusculae vel interdum superne pubescentes, tenues, plurinerves, pallidae, aristatae; aristae hispidulo-pubescentes. *Utriculi* 4 mm. longi, oblique patentes, squamis plerumque distincte longiores latioresque, trigoni, obovati vel obovato-elliptici, valde plurinerves, inferne glabri, interdum superne nervis parce hispiduli, in rostrum mediocre latum marginibus hispidulum ore alte bidentatum subabrupte contracti. *Stigmata* 3.

ANGOLA: District of Moxico; between R. Monu and R. Kampashi, in *Brachystegia* woodland, on sand, 19 January 1938, *Milne-Redhead* 4222.

XXI—THE TYPE OF CORYMBIUM AFRICANUM L.

T. A. Sprague.

The following investigation was undertaken in response to a request received from Mrs. M. R. Levyns of Cape Town, in connexion with the Flora of the Cape Peninsula now in course of preparation. The genus *Corymbium* has recently been revised by Miss E. I. Markötter*, who has applied the name *Corymbium africanum* L. to *C. glabrum* L. (*C. nervosum* Thunb.). Miss Markötter's argument may be summed up as follows :

I. *Corymbium africanum* L. (1753) comprised two species now recognized as distinct, namely 1, *C. scabridum* Berg., 1767 (*C. scabrum* L., 1767), and 2, *C. glabrum* L., 1767 (*C. nervosum* Thunb., 1794).

II. Bergius in 1767 based *Corymbium scabridum* Berg., on the first two synonyms of *C. africanum* cited by Linnaeus (Sp. Pl. ed. 1, 928), namely, on *Corymbium foliis ad radicem longissimis liratis* Burm. Afr. 189, t. 70, f.1, and *Bupleurifolia, semine papposo, valerianoides umbellata cauliculo scabro* Pluk. Alm. 73, t. 272, f.5.

III. Linnaeus later in 1767 segregated *C. scabrum* L., which was likewise based on the first two synonyms of *C. africanum* L. (1753). He observed that these synonyms should be excluded from *C. africanum*.

IV. The name *C. africanum* L. must accordingly be restricted to its remaining element, namely, to *Bupleuri similis planta aethiopica, ad caulium nodos tomentosa* Pluk. Alm. 73, t. 272, f.4.

It will be observed that this argument is based on the so-called " method of residue," that is, it rests on the assumption that, when a taxonomic group is divided into two or more groups of the same rank, its name must be retained for *what is left* after segregation of the newly named groups. Such a method of applying names was frequently followed *before* the formal introduction of the type-method into the International Rules in 1930, but is now rejected: under Art. 18, " the application of names of taxonomic groups is determined by means of *nomenclatural types*." The question to be decided is accordingly : What is the type of *Corymbium africanum* L. Sp. Pl. ed. 1, 928 (1753) ?

The text of *C. africanum* L. in Sp. Pl. ed. 1 is as follows :

africanum. 1. CORYMBIUM. *Hort. Cliff.* 494.
Corymbium foliis ad radicem longissimis liratis *Burm. afr.* 189, *t.* 70. *f.*1 Bupleurifolia, semine papposo, valerianoides umbellata, cauliculo scabro. *Pluk. alm.* 73. t. 272, f.5.
Bupleuri similis planta aethiopica, ad caulium nodos tomentosa. *Pluk. alm.* 73. *t.* 272, *f.*4.
Habitat in Aethiopia.

It should be noted that *Corymbium africanum* was a binary name for the species named *Corymbium* in Hort. Cliff. Linnaeus

* Engl. Bot. Jahrb. **70,** 354–372 (1939).

did not describe *C. africanum* in Sp. Pl. ed. 1 : no diagnostic phrase was required for the species, since he regarded the genus *Corymbium* as monotypic. He referred, however, to the specific description supplied by him in Hort. Cliff. 494 (1737). The account of *Corymbium* there given is as follows :

CORYMBIUM *cor. g.* 976.

1. CORYMBIUM
   Bupleurifolia semine papposo Valerianoides umbellata, cauliculo scabro. *Pluk. alm.* 73. *t.* 272, *f.*5.

α Bupleuri similis planta aethiopica, ad caulium nodos tomentosa. *Pluk. alm.* 73. *t.* 272, *f.*4.
Crescit in Aethiopia.
Radix coronatur lana seu capillis longis inque tophum congestis. Folia radicalia copiosissima, linearia, margine involuta, hinc subulato-setacea, spithamaea vel pedalia. Caulis pedalis, teres, erectus, purpurascens, scaber, instructus foliis aliquot alternis, lanceolatis, amplexicaulibus, e quorum alis superioribus racemi compositi, qui omnes fastigiati in corymbum flores ferunt.

It will be observed that Linnaeus distinguished typical *Corymbium* and a variety α. The former was based on two elements : (1) *Bupleurifolia etc.* Pluk. t. 272, f.5, and (2) a specimen in the Clifford herbarium, from which he had prepared the description given at the end of his account. There is no dispute that the specimen in the Clifford herbarium is conspecific with *C. scabridum* Berg. (1763), that the description refers to *C. scabridum*, and that Plukenet's t.272, f.5 represents *C. scabridum*. Typical *Corymbium* L. Hort. Cliff. (1737) is accordingly entirely conspecific with *C. scabridum* Berg. The variety α, based on Plukenet's t.272, f.4, is conspecific with *C. glabrum* L.

Since the binary name *Corymbium africanum* L. (1753) was based on *Corymbium* Hort. Cliff., it has *the same type*, and must accordingly be applied to *C. scabridum* Berg.

Comparison of the accounts of *Corymbium* Hort. Cliff. 494 and *C. africanum* Sp. Pl. ed. 1, 928, reveals two differences :

(1) Linnaeus introduced an additional synonym in 1753, namely, *Corymbium foliis ad radicem longissimis liratis* Burm. Afr. 189, t. 70, fig. 1. He inserted this immediately after the reference to Hort. Cliff., that is, *before* those to Plukenet's figures. Burmann's figure represents *C. scabridum* Berg.

(2) Linnaeus in 1753 no longer distinguished *Corymbium* var. α of Hort. Cliff. as a variety : he cited *Bupleuri similis planta aethiopica, ad caulium nodos tomentosa* Pluk. Alm. 73, t. 272, fig. 4, as a direct synonym of *C. africanum*.

The fact that Linnaeus in 1753 no longer distinguished the var. α of Hort. Cliff. as a variety does not mean that he had ceased to regard the strigose-stemmed plant as typical of the species. Indeed, his insertion of the Burman reference *before* the Plukenet's references suggests that he regarded it as a better representation of *C.*

africanum. A further reason, if any were required, for regarding the type of *Corymbium* Hort. Cliff. (1737) as being the type also of *Corymbium africanum* Sp. Pl. ed. 1 (1753), is that Linnaeus had up to the latter date seen no further material which might have led to a re-orientation of his concept of the species. There is no specimen named *Corymbium africanum* in his herbarium—vide B. D. Jackson, Index Linn. Herb. 63 (1912).

Since the publication of a name is validated by the provision of a description, or by a reference to a former description, the specimen on which the description was based is—ceteribus paribus—the type of the name. It follows that the specimen in the Clifford herbarium is the type of *C. africanum* L. Sp. Pl. ed. 1, 928 (1753). No subsequent action, whether by Linnaeus himself or by any other botanist, can affect this conclusion. The name *Corymbium africanum* L. should accordingly be applied to *C. scabridum* Berg.

Up to 1763 Linnaeus seems to have made no modification in his concept of *C. africanum* (1753) : the account of that species in Sp. Pl. ed. 2, 1317 (1763) is the same as that in ed. 1, except for a printer's error in the reference to *Bupleuri similis etc.* Pluk., where " f. 4, 5 " appears instead of " f.4." By 1765, however, Linnaeus had come to the conclusion that his *C. africanum* of 1753 included two distinct species, one with scabrid stems (Pluk. f.5), and the other with smooth stems and broader leaves, bearded in the axil. In a letter to J. and N. L. Burman, dated 8th January 1765, dealing with a collection of Cape plants which they had sent him, he referred to a specimen of *Corymbium*, bearing the number " 2," and asked them to look among their plants to see if there were another, distinct species, with broader leaves, bearded from the axil, and a smooth stem : " Quaere inter tuas numne et alia distincta species detur foliis latioribus ex ala barbatis, caule laevi " (H. C. van Hall, Epist. Ined. Caroli Linnaei, 84 : 1830). At that date Linnaeus apparently regarded the scabrid-stemmed plant [*C. scabridum* Berg.] as typical *C. africanum* and the smooth-stemmed barbate plant [*C. glabrum* L.] as a distinct new species. In his ' Mantissa prima,' (Oct. 1767) Linnaeus segregated the scabrid-stemmed plant under the new name *Corymbium scabrum* L., with the diagnostic phrase " *Corymbium* caule scabro," appending the observation that the relevant synonyms from Burman and Plukenet should be excluded from *Corymbium africanum*. This suggests that Linnaeus intended, at the time of writing, to reserve the name *Corymbium africanum* for the smooth-stemmed plant. But in his ' Systema Naturae,' ed. 12, 2, 582, also published in Oct. 1767, he proposed the name *Corymbium glabrum* L. for the smooth-stemmed plant. As in other instances, he abandoned the original name of the species (*C. africanum*), proposing new names for each of the segregates. It may be noted that, apart from the fact that many page-numbers of the ' Mantissa '* are cited in the " Systema," ed. 12, vol. 2, there is

* E.g. pp. 24, 66, 121, 136 of the " Mantissa " are cited on pp. 56, 272, 591 and 720 of Syst. Nat. ed. 12, vol. 2.

nothing to suggest that the 'Mantissa' appeared first. Indeed, it seems probable that they were issued together, since the last page of the Systema, vol. 2, has the letters "MAN-" near the bottom, an indication that the *next page* began with those letters. According to Richter, Codex Botanicus Linnaeanus, p. xxxi, both works appeared in October 1767.

The name *Corymbium scabridum* Berg. had been published by Bergius, Descr. Pl. Cap. 341 (Sept. 1767) for the scabrid-stemmed species. Miss Markötter states that Bergius described *C. scabridum* as a *new species*. Actually it was a *new name* for an old species, viz., for *Corymbium* L. Hort. Cliff. 494, which Bergius cited as a synonym, and ipso facto a new name for *C. africanum* L. (quoad typum).

CONCLUSIONS.

1. The type of *Corymbium africanum* L. (1753) is the type-specimen of *Corymbium* L. Hort. Cliff. 494.
2. *C. africanum* L. (1753) is conspecific with and antedates *C. scabridum* Berg. (1767).
3. The following changes in the nomenclature adopted in Miss Markötter's revision are accordingly required.

   A : *Corymbium* no. 3, *C. scabridum* Berg., becomes *C. africanum* L. (1753).

   B : *Corymbium* no. 11, *C. africanum* L. sec. Markötter (non L. 1753 quoad typum), becomes *C. glabrum* L. (1767).

XXII—MISCELLANEOUS NOTES.

"Cotine" or "Erbifex."—In the daily press some 10–11 years ago there were frequent references to a new natural fibre called "Cotine" or "Erbifex," *Asclepias incarnata* L., and Kew received numerous enquiries as to its commercial possibilities, about which somewhat extravagant claims were put forward by company-promoting concerns. The species is a native of North America where it is known as "American Swamp Milkweed," and commercial production was attempted in Britain but without success.

It had long been known that this species yielded a fibre and suggestions for its utilization were made in the United States in the latter part of last century. An interesting document has now been received at Kew, however, which shows that the fibrous qualities of the species were known as early as 1815. In a deed drawn up by Charles Whitlow,* Botanist, of the New York Coffee House, Sweetings Alley, Middlesex, addressed to His Most Excellent Majesty King George the Third, we learn that he "should and lawfully might make use exercise and vend within England Wales

* Charles Whitlaw (sometimes spelled Whitlow), author of "Whitlaws New Medical Discoveries, with a defence of the Linnean Doctrine and a translation of his Vegetable Materia Medica, which now appears in an English Dress," London, 1829.

and the Town of Berwick upon Tweed my Invention of The Working or making of certain Manufactures from certain Plants of the Genus Urtica and Esclipius growing in North America and not heretofore used in this Realm whereby the fabricated products usually had made or obtained from Hemp, Flax, Cotton, Silk and other the like fibrous Materials or the Seeds or the parts thereof may be beneficially had made or obtained In which said Letters Patent there is contained a Proviso obliging me the said Charles Whitlow by an Instrument in writing under my hand and seal to cause a particular description of the nature of my said Invention and in what manner the same is to be performed to be Inrolled in His Majesty's High Court of Chancery within six calendar months after the date of the said recited Letters Patent as in and by the same (relation being thereunto had) may more fully and at large appear Now Know Ye that in compliance with the said Proviso I the said Charles Whitlow do hereby declare that the nature of my said Invention and manner of performing the same are particularly described and ascertained in manner following, that is to say— I do take use and manufacture for the purpose aforesaid certain Plants not before worked or manufactured in Great Britain which have been first worked and used by me in Great Britain and of which Plants I do give the Botanical description in the usual words or terms of Art in the Latin language as here follows....."

Three species of *Urtica* are first described and then the *Asclepias* in the following terms :—" Asclepias incarnata Linneus Asclepias pulchra Ehrhart et undique pubescens foliis approximatis oblongis acutis basi obtusis, brevissime petiolatis, umbellis aggregatis origine geminis corniculis appendicum subexsertis. obs. Radix crassa carnosa similis tuberosa."

English translations of the descriptions follow, the document being witnessed and sealed by a magistrate, and a five pound stamp affixed.

Kew is indebted to the honorary secretary of the British Records Association for this interesting document which has been placed in the Museum files.

Vegetative Propagation of Tropical Crops.*—This publication is complementary to that published in 1936 by the Imperial Bureau of Fruit Production (as it was then styled), which dealt with the vegetative propagation of a large variety of fruits grown in the Tropics and Sub-Tropics. The demand experienced for this memoir has led the same authors to compile the present volume, and there is every reason to suppose that it will meet with a similar response from workers in the tropics.

* " Vegetative Propagation of Tropical and Sub-tropical Plantation Crops," by G. St. Clair Feilden and R. J. Garner. Technical Communication No. 13 of the Imperial Bureau of Horticulture and Plantation Crops, East Malling, Kent, England, 1940. Pp. 99. Price 3/6.

The work includes a description of a large number of plantation crops, many of which, such as sugar cane, rubber, coffee, cacao, and sisal, are already of great economic importance, whilst others have at present a limited use which may extend when their values are more properly appreciated in the world of commerce. No mention is made of the cashew nut which now commands a considerable market, and other varieties are now beginning to attract the attention of the planter, so that it will undoubtedly be necessary to bring the volume up to date in a few years time.

One is glad to see that the section of the previous publication which dealt with the methods of vegetative propagation has not only been retained but has been considerably enlarged and that the descriptions are now supported by delightfully simple and clear line drawings. The mention of the use of loosely woven baskets as a substitute for pots or bamboo sections in nursery work in the tropics is also well illustrated, and is deservedly included as this method now has an increasing vogue.

The authors are to be congratulated on having succeeded in bringing together much invaluable information in a compact form, and the volume should prove extremely useful to those engaged in the cultivation of tropical crops.

Botanical Magazine.—Part 4 of vol. 162 which was published on 22nd April contains the following plant portraits:

Iris Wattii Baker (t.9590), Assam and Yunnan; *Camellia Sasanqua* Thunberg (t.9591), southern Japan; *Tritonia flavida* Schlechter (t.9592), Natal; *Primula amoena* M. Bieberstein (t.9593), Caucasus and N.E. Turkey; *Paeonia Clusii* F. C. Stern (t.9594) a new name for a species native of Crete; *Aeschynanthus mimetes* B. L. Burtt (t.9595), a new species, Assam to S.W. Yunnan; *Aristolochia Lindneri* Berger (t.9596), Bolivia; *Rhododendron exquisitum* Hutchinson (t.9597), S.W. Szechwan; *Cyananthus microphyllus* Edgeworth (t.9598), Nepal and N. India; *Viola Stojanowii* W. Becker var. *latifolia* Turrill (t.9599), a new variety, Bulgaria; and *Abies lasiocarpa* (Hook.) Nuttall (t.9600), North America.

The volume is dedicated to Captain Frank Kingdon Ward in recognition of his services to Botany, Horticulture and Geography.

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